PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference LU6037	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/07567	International filing date *(day/month/year)* 14.07.2003	Priority date *(day/month/year)* 15.07.2002
International Patent Classification (IPC) or both national classification and IPC C08F10/00		
Applicant BASELL POLYOLEFINE GMBH et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
20.11.2003	07.10.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Thomas, D Telephone No. +49 89 2399-7837

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/07567

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-33 as originally filed

Claims, Numbers

1-10 received on 08.07.2004 with letter of 05.07.2004

Claims, Pages

34-35 received on 08.07.2004 with letter of 05.07.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:
D1: WO 9961487
Document D1, which is considered to represent the most relevant state of the art, discloses in example 3 a process for the preparation of a catalyst for olefin polymerization. An organic transition metal compound (Dimethylsiandiyl bis (2.n-propyl-4-(4'-tert.-butyl-phenyl)indenyl)zirconium dichloride is first reacted with a five fold excess of trimethyl aluminum. The resulting mixture contains at least the following products:

-(Dimethylsiandiylbis(2.n-propyl-4-(4'-tert.-butyl-phenyl)indenyl)zirconiumdimethyl
-trimethyl aluminum
-dimethyl aluminum chloride

The subject matter of claim 1 differs from the above described mixture as dimethyl aluminum chloride falls not under the definition of the organometallic compounds described in claim 1 under B (R_{1-3} can not be Cl)

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).
The independent claims 8-10 refer back to claim 1 and are therefore regarded to be new as well.

The technical effect brought by the above described difference is an improvement of the polymerization activity of the supported catalyst system.
(see example 1 of the application vs. comparative example A - a 2.5-fold increase of catalyst activity).
The objective technical problem to be solved is to provide a supported catalyst system with improved activity. None of the cited prior art documents disclose the use of two different organometallic compounds as defined under B of claim 1 of the present application in order to solve this problem.
The solution to this problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT) .
Claims 8-10 refer back to claim 1 and as such also meet the requirements of the PCT inventive step.

new set of claims (July 2004)

We claim:

1. A process for preparing a catalyst for olefin polymerization which is obtainable by bringing

A) at least one organic transition metal compound,

B) a mixture of at least two different organo metallic compounds of formula (V),

$$M^1(R^1)_r(R^2)_s(R^3)_t \qquad (V)$$

where

M^1 is an alkali metal, an alkaline earth metal or a metal of group 13 of the Periodic Table,

R^1 is hydrogen, C_1-C_{10}-alkyl, C_6-C_{15}-aryl, halo-C_1-C_{10}-alkyl, halo-C_6-C_{15}-aryl, C_7-C_{40}-arylalkyl, C_7-C_{40}-alkylaryl, C_1-C_{10}-alkoxy or halo-C_7-C_{40}-alkylaryl, halo-C_7-C_{40}-arylalkyl or halo-C_1-C_{10}-alkoxy,

R^2 and R^3 are each hydrogen, C_1-C_{10}-alkyl, C_6-C_{15}-aryl, halo-C_1-C_{10}-alkyl, halo-C_6-C_{15}-aryl, C_7-C_{40}-arylalkyl, C_7-C_{40}-alkylaryl, C_1-C_{10}-alkoxy or halo-C_7-C_{40}-alkylaryl, halo-C_7-C_{40}-arylalkyl or halo-C_1-C_{10}-alkoxy,

r is an integer from 1 to 3

and

s and t are integers from 0 to 2, where the sum r+s+t corresponds to the valence of M^1,

and

C) at least one cation-forming compound

into contact with one another, wherein the organic transition metal compound A) is firstly combined with the mixture of the organo metallic compounds B).

2. A process for preparing a catalyst for olefin polymerization as claimed in claim 1, wherein

D) at least one support

is used as further component.

3. A process for preparing a catalyst for olefin polymerization as claimed in claim 1 or 2, wherein

E) at least one Lewis base

is used as further component.

4. A process for preparing a catalyst for olefin polymerization as claimed in any of claims 1 to 3, wherein the cation-forming compound is a strong uncharged Lewis acid, an ionic compound having a Lewis-acid cation, an ionic compound containing a Brönsted acid as cation or a compound of the aluminoxane type.

5. A process for preparing a catalyst for olefin polymerization as claimed in any of claims 1 to 4, wherein the cation-forming compound is obtained during the preparation of the catalyst by reaction of a compound having at least one functional group containing active hydrogen with an organometallic compound.

6. A process for preparing a catalyst for olefin polymerization as claimed in claim 5, wherein the compound having at least one functional group containing active hydrogen is a hydroxyl-containing compound.

7. A process for preparing a catalyst for olefin polymerization as claimed in claim 6, wherein the hydroxyl groups are bound to an element of main group 13, 14 or 15 of the Periodic Table.

8. The use of a catalyst prepared as claimed in any of claims 1 to 7 for the polymerization of olefins.

9. A catalyst obtainable by a process as claimed in any of claims 1 to 7.

10. A process for the polymerization of olefins using a catalyst as claimed in claim 9.